and what he had to struggle against previous to his visiting London in 1821.

In reference to these struggles, the following singular fact may not prove uninteresting to those fond of the marvellous; and had not the circumstance occurred in my presence, I should have doubted its truth:—One morning during the summer of 1818, I called at Rooke's lodgings, and on entering the room found him in a state of great dejection. 'How are you, Billy?' said I (my usual salute). 'As well as a man can be,' he replied, 'who has not yet had his breakfast, and who has not a farthing in his pocket to procure one.' This was at eleven o'clock. At the very moment that this reply was uttered, our eyes were attracted by a light piece of paper, which for a short time floating over our heads, finally settled upon the floor; and our astonishment may be imagined on discovering it to be a bank note! It would not be easy to describe my feelings. I gazed on the object intently, scarcely believing it a reality, although I could plainly see the prominent features of its value—Thirty Shillings! We both remained for some minutes motionless, except that our eyes were cast alternately from the object of our wonder to the various parts of the room, seeking a cause for so unexpected but welcome a visitor. This apparent mystery, however, was soon explained. Some months previous, Rooke had missed a thirty-shilling note, and supposed it to have been stolen from him. On the morning of my call he had been seeking some manuscript music stowed away in a press near the window, the upper sash of which was down; and in his search the long-lost note had thus been exposed to a strong current of air, which ultimately dislodging it from its place of concealment, restored it to its owner at a moment when it was so much wanted.

When last in London, during an evening's chat with my friend, casting our thoughts back upon old times and circumstances, I brought to his recollection the fact here related, the singularity of which principally rests upon the strange chance of the mislaid note re-appearing at such a time and in such a manner; and I question whether, in all its rambles before or since, the said thirty-shilling note ever came to hand so opportunely." B. W.

THE NATURE OF WATER.

We concluded a previous notice of some of the uses to which water is subservient in nature, by mentioning that modern science had fully proved the incorrectness of the ancient idea of the elementary nature of water; and that by the processes which chemistry places at our disposal, we are now able to resolve water into its elements, or, having obtained these elements from other sources, to cause them to unite, and to produce water in combining. In the present article we shall point out the manner in which this may be accomplished, and describe some properties and uses of water which the space at our disposal did not allow us to notice before.

Water consists in great part of the substance to which is due the power the atmosphere possesses of supporting life and combustion, and of which we have formerly spoken under the name of oxygen. Every nine ounces of water contain eight ounces of oxygen, the remainder being made up of another and very peculiar substance, termed hydrogen. Hydrogen is a gas, invisible, colourless, and transparent, and consequently in all external characters precisely like the air we breathe. But it differs from it very much in other respects. If a lighted candle be placed in hydrogen gas, the candle is extinguished, for hydrogen does not support combustion, but the gas itself takes fire, where it mixes with the air, and burns with a pale yellowish flame, scarcely visible in broad day-light. Hence hydrogen is in its properties the very reverse of oxygen: it burns, which oxygen does not; oxygen supports combustion, which hydrogen cannot do. When hydrogen burns with oxygen, water is always formed.

Now, to decompose water it is only necessary to act upon the principle of hydrogen being a combustible substance. All substances are not equally combustible; that is to say, they do not burn or combine with oxygen with equal facility or quickness. Thus charcoal is more combustible than iron, iron is more combustible than copper, and copper than gold or silver, whilst phosphorus is still more combustible than charcoal. Now, oxygen will combine with any of these combustible substances; but if it have a choice, it will take that which is most combustible—that which it likes best. And even if the oxygen be already united with one body, and that another more combustible be brought into action on it, it will leave the former, and attach itself altogether to the latter substance. The combustibility of hydrogen is about equal to that of iron. It is inferior to carbon and to many other bodies; but it is superior to that of copper, silver, gold, and others. If, therefore, we take water in the state of steam, and bring it into contact with red-hot charcoal or coke, the oxygen of the water goes to the most combustible body, and the hydrogen is set free. In this way charcoal may be made to burn brilliantly without air, but not without oxygen. A red-hot bit of charcoal burns in steam, because it decomposes the water; it takes the oxygen, and turns the hydrogen out, which assuming the form of gas, may be collected by means of peculiar chemical apparatus.

Iron and hydrogen are, as mentioned above, about equally combustible: in fact it depends upon the degree of heat, which is the more combustible. If the iron be bright red, it decomposes water, taking away the oxygen; but if it be only dull red, then hydrogen is the more combustible; and if there be a compound of oxygen and iron ready formed (oxide of iron, rust), the hydrogen will decompose it, and water being formed, the iron will be set free. If, therefore, a gun barrel be laid across a fire, and heated to bright redness, and a little water be poured into it at one end by means of a tundish with a stop-cock soldered to it, hydrogen gas will issue from the other end, and may be burned, or collected for various purposes.

Hydrogen gas may be prepared more easily by other processes, which do not show, however, so clearly the fact of its being derived from the decomposition of the water. The property which iron acquires at a bright red heat may be given to it without any heat, by means of some oil of vitriol (called in the language of chemists, sulphuric acid). Iron quite cold will decompose water, if the water be previously mixed with some sulphuric acid. The oxygen goes to the iron, which dissolves, and the liquor contains green copperas. The metal zinc, which is now so very much used in the arts, may also be employed with sulphuric acid and water to decompose water, and it gives a purer hydrogen gas than iron, the latter metal containing always a little charcoal, which mixes with the hydrogen and contaminates it.

In all of these processes, although the water is decomposed, yet we obtain only one of its elements; the other, the oxygen, remaining combined with the iron, the charcoal, or the zinc. We may, however, produce the separation of water into its elements, so as to exhibit both. This is done by passing a current of electricity from the apparatus termed the galvanic battery, through the water. One of the grandest and most fruitful discoveries ever made in chemistry was that by Sir Humphry Davy, who proved that electricity possesses the power of separating compound substances into their elements; and by that means he succeeded in decomposing numerous bodies which had resisted all processes known before that time, and obtained new substances of a simple nature, and of most curious and important properties. To decompose water by means of electricity, the wires from the galvanic battery are made to dip into a little cup of water, and over each wire there is hung a bell-shaped vessel, inverted, full of water. When the current passes, pure oxygen gas is disengaged from one wire, and pure hydrogen gas is liberated at the other, and being received as the bubbles rise in the bell-glasses, the gases are collected for use.

So much for the separation of water into its elements; the production of water by the union of its elements is still easier. The simplest way to show this is to take a little bottle, and put into it the zinc, water, and sulphuric acid, by which the hydrogen is to be obtained, to fit to the mouth of the bottle a cork, through which passes a little glass or metal tube, ending in a fine jet. The gas may be set on fire as it issues from the jet, and by holding a cold plate or a tumbler over the flame, and at a little distance, a copious dew of water will be deposited upon it, which after a few moments will increase so much as to run into large drops. This water is formed by the hydrogen gas combining as it burns with the oxygen of the air.

Hydrogen gas in burning produces very little light: one cause of this is, that the product of combustion-formed water being in a state of steam, there is no solid substance in the flame; and it appears to be always true that no bright light can exist without a solid material. In order to produce a great light with the flame of hydrogen gas, it is only necessary to place a wire or a bit of flint, or any solid substance, in the flame. The solid immediately becomes intensely bright, and

by using lime or magnesia, which are peculiarly fitted for the purpose, a light so intense as to be only surpassed by the noon-day summer sun, may be obtained. This lime light has been introduced for experiment into lighthouses, and has been particularly serviceable in the trigonometrical surveys of these kingdoms, in consequence of which it is generally known as the Drummond light, from the eminent philosopher whose recent melancholy loss every Irishman must deplore. The heat produced by the flame of hydrogen is thus most intense; substances which are inattackable by the strongest furnaces melt like wax in the jet of oxygen and hydrogen, and in the Drummond light the lime appears gradually to evaporate.

A mixture of hydrogen and oxygen, or of hydrogen and air, may be thus set fire to by a candle; and when previously mixed, a terrific explosion is produced. Persons should therefore be very cautious how they perform experiments with hydrogen, as even skilful chemists have occasionally suffered severely from accidents of this kind. When a young person makes hydrogen for the first time, he is naturally curious, and hastens to satisfy himself by seeing that it burns: he applies the candle before all the common air has been expelled from the apparatus, and the mixture inside being still explosive, the flame passes back, and the whole is shattered into pieces with the noise and violence of a bombshell. At the same time, therefore, that we would be happy if this article induced many of our young readers to satisfy themselves of the composition and decomposition of water by actual experiment, yet we trust they will do so prudently, and with the guidance of some older person who has previously seen how chemical apparatus are employed.

If a wide tube of glass be held over the jet of burning hydrogen gas, a very curious result is produced: a powerful musical sound is heard, which changes according as the jet is moved up and down in the tube. The nearer the jet is to the orifice, the graver, the higher up in the tube it is, the more acute, is the sound heard. The cause of this is, that the flame, which to the eye appears uniform and continuous, is in reality a number of very small explosions of mixed air and gas. These succeed one another so rapidly that the intervals of darkness which intervene are not perceived, and the quantity of gas which explodes is too small to produce any audible noise; but on bringing a tube, the air in which is capable of vibrating with the same quickness as the little explosions are produced, the air is thrown into vibrations which reach the ear, and produce the peculiar musical tone. With a selection of gas jets and tubes a variety of notes may be produced, so great that a musical instrument has been constructed by their means.

Hydrogen gas is the lightest substance in nature, and it is consequently used to fill balloons, by which men have been carried to a height in the air much exceeding that of the loftiest mountains. When balloons were first made use of, they were of the kind which are now termed fire-balloons: the bag of the balloon was open at the bottom, and in the car was a *furnace, the chimney* of which terminated at the aperture of the balloon. The hot air and gases generated by the burning of the fuel in the furnace ascending into the bag, expelled the heavier cold air, and a sufficient power of rising was thus obtained, by the difference between the weight of the heated and of the cold air, to enable the balloon to take up a very considerable weight. Hydrogen gas being, however, at least ten times as light as the hot air, was much more convenient, as it required only a much smaller balloon; and the unfortunate death of the most remarkable experimenter of the fire-balloon, Pilatre de Rozier, contributed also very much to show their great danger, and prevent their being used.

Although many persons had proposed from time to time to ascend by means of balloons filled with heated or rarified air, or with hydrogen gas, it was reserved for the brothers Montgolfier of Lyons to realize this bold and singular idea. These brothers had originally been destined to science, but on the death of an elder brother who had been an extensive paper maker at Lyons, they abandoned their former pursuits to continue the manufacture. They made large paper balloons, which, whether filled with hydrogen gas or heated air, ascended, and one brother ascended to a small height at Lyons. On introducing their invention to the notice of the public and the royal family at Paris, the greatest enthusiasm was excited, and personages of the highest rank accompanied the adventurous brothers in their aërial voyages. Pilatre de Rozier, then director of the king's museum, devoted himself completely to the improvement of the new art of the navigation of the air; and after having ascended from Versailles frequently, and gained a considerably greater height than any of his predecessors, he resolved to cross the British Channel, and pass from France to England in a fire-balloon. He ascended from a village about half way between Calais and Boulogne, on September the 16th, 1784, with a gentleman of the town as a companion; and having attained a considerable height, was carried by the favourable wind over the sea in his proper course. The balloon however continuing to rise, got into a current of air in an opposite direction, and was brought again over the land; at this moment the spectators on shore were horrified to observe that the balloon, half lost in the clouds, was on fire, and after a moment the car was observed to fall. The remains of the car and of the unfortunate aëronauts, in whom scarcely a vestige of human form could be traced, were found in a field on the road to Abbeville; and a stone bearing the simple inscription of the fate of Pilatre de Rozier and his companion marks to the present day the place, close by the road-side, where the bodies were inhumed.

The substitution of hydrogen or of coal gas for the fire-balloon, has deprived aërial navigation of its greatest dangers. No good means of steering or tacking a balloon having been discovered, the art has not yet fulfilled the expectations that were at first formed of it: the balloon is at the mercy of the winds; and although the voyagers travel in ease and safety, and often with rail-road speed, yet as it cannot be foretold in what direction the balloon must go, voyages in the air have been as yet only an exciting and not very dangerous amusement. K.

THE THEATRE.—I approach a subject, on which a great variety of opinion exists, and that is the theatre. In its present state the theatre deserves no encouragement. It is an accumulation of immoral influences. It has nourished intemperance and all vice. In saying this, I do not say that the amusement is radically, essentially evil. I can conceive of a theatre which would be the noblest of all amusements, and would take a high rank among the means of refining the taste and elevating the character of a people. The deep woes, the mighty and terrible passions, and the sublime emotions of genuine tragedy, are fitted to thrill us with human sympathies, with profound interest in our nature, with a consciousness of what man can do, and dare, and suffer, with an awed feeling of the fearful mysteries of life. The soul of the spectator is stirred from its depths, and the lethargy in which so many live is roused, at least for a time, to some intenseness of thought and sensibility. The drama answers a high purpose when it places us in the presence of the most solemn and striking events of human history, and lays bare to us the human heart in its most powerful, appalling, glorious workings. But how little does the theatre accomplish its end! How often is it disgraced by monstrous distortions of human nature, and still more disgraced by profaneness, coarseness, indelicacy, low wit, such as no woman, worthy of the name, can hear without a blush, and no man can take pleasure in without self-degradation!—*Dr Channing on Temperance.*

CONSECRATED IRISH BELLS.—Consecrated bells were formerly held in great reverence in Ireland, particularly before the tenth century. Cambrensis, in his Welsh Itinerary, says, "Both the laity and clergy in Ireland, Scotland, and Wales, held in such great veneration portable bells, and staves crook't at the top, and covered with gold, silver, and brass, and similar relics of the saints, that they were much more afraid of swearing falsely by them than by the gospels, because from some hidden and miraculous power with which they were gifted, and the vengeance of the saint, to whom they were particularly pleasing, their despisers and transgressors are severely punished." Miraculous portable bells were very common; Giraldus speaks of the *Campana fugitiva* of O'Toole, chieftain of Wicklow; and Colgan relates, that whenever St Patrick's portable bell tolled, as a preservative against evil spirits and magicians, it was heard from the Giants' Causeway to Cape Clear, from the Hill of Howth to the Western shores of Connemara.—*Hardiman's Irish Minstrelsy.*

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